

# Biological Carbon Capture Technologies

## Physical component

**M**onday 12th June 2023

**8:30-9:00** Arrival and registration

**9:00-9:10** Welcome and introduction

M<sup>a</sup> del Rosario Rodero/Raúl Muñoz (organizing committee)/Pedro A. Encina (Head of the Institute of Sustainable Processes). Welcome to the Biological Carbon Capture Technologies Course and presentation of the Institute of Sustainable Processes

### MODULE 1. MICROBIOLOGY TOOLS

**9:10-11:00** Sara Cantera (Institute of Sustainable Processes, UVa). Microbial Ecology in the Era of NGS

**11:00-11:30** Coffee break

**11:30-12:30** Sara Cantera (Institute of Sustainable Processes, UVa). Multiomics from gen to functionality

**12:30-13:30** Sara Cantera (Institute of Sustainable Processes, UVa). Questions & Applications of molecular biology on your own systems

**13:30-15:00** Lunch

### MODULE 2. ANAEROBIC MICROBIAL CULTIVATION AND CATALYSIS FOR CONVERSION OF C1 SUBSTRATES

**15:00-16:00** Martijn Diender (Wageningen University & Research). Microbial physiology of different types of C1 metabolism and their applications

**16:00-17:00** Martijn Diender (Wageningen University & Research). Redox and energy metabolism of C1 conversion and their importance in designing biotechnological processes

**17:00-17:30** Coffee break

**17:30-18:30** Martijn Diender (Wageningen University & Research). Case of study of anaerobic conversion of C1 substrates



# Tuesday 13th June 2023

## MODULE 2. ANAEROBIC MICROBIAL CULTIVATION AND CATALYSIS FOR CONVERSION OF C1 SUBSTRATES

9:00-11:00 Martijn Diender (Wageningen University & Research). Microbial cultivation/production techniques and strategies for conversion of C1 substrates

11:00-11:30 Coffee break

11:30-12:30 Martijn Diender (Wageningen University & Research). Microbial cultivation/production techniques and strategies for conversion of C1 substrates. Case study

## MODULE 3. PURPLE PHOTOTROPHIC BACTERIA FOR CARBON CAPTURE AND RECYCLING

12:30-13:30 Gabriel Capson-Tojo (Laboratoire de Biotechnologie de l'Environnement, INRAE).

Introduction to Purple Phototrophic Bacteria (PPB)

13:30-15:00 Lunch

15:00-16:00 Gabriel Capson-Tojo (Laboratoire de Biotechnologie de l'Environnement, INRAE). Purple Phototrophic bacteria and resource recovery: why are they interesting?

16:00-17:00 Gabriel Capson-Tojo (Laboratoire de Biotechnologie de l'Environnement, INRAE). Purple Phototrophic bacteria and resource recovery: state of the art

# Wednesday 14th June 2023

## MODULE 2. ANAEROBIC MICROBIAL CULTIVATION AND CATALYSIS FOR CONVERSION OF C1 SUBSTRATES

9:00-11:00 Martijn Diender (Wageningen University & Research). Practical infrastructure in research in C1 anaerobic microbiology

11:00-11:30 Coffee break

## MODULE 3. PURPLE PHOTOTROPHIC BACTERIA FOR CARBON CAPTURE AND RECYCLING

11:30-13:30 Gabriel Capson-Tojo (Laboratoire de Biotechnologie de l'Environnement, INRAE).

Workshop 1: introduction to mechanistic modelling of bioprocesses

13:30-15:00 Lunch

15:00-16:00 Gabriel Capson-Tojo (Laboratoire de Biotechnologie de l'Environnement, INRAE).

Fundamentals of mechanistic modelling of bioprocesses based on Purple Phototrophic bacteria

16:00-17:00 Technical visit to the laboratories of the Institute of Sustainable Processes



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## hursday 15th June 2023

### **MODULE 3. PURPLE PHOTOTROPHIC BACTERIA FOR CARBON CAPTURE AND RECYCLING**

9:00-11:00 Gabriel Capson-Tojo (Laboratoire de Biotechnologie de l'Environnement, INRAE).

Workshop 2: development and implementation of a model for enriched purple phototrophic bacteria cultures grown outdoors

11:00-11:30 Coffee break

### **MODULE 4. MICROALGAE FOR CARBON AND NUTRIENTS RECOVERY**

11:30-13:00 M<sup>a</sup> del Rosario Rodero (Institute of Sustainable Processes, UVa). Microalgal biotechnology for resource recovery from wastewater

13:00-14:30 Lunch

### **MODULE 5. ORGANIC WASTE BIOCONVERSION VIA ANAEROBIC NO PHOTOTROPHIC PROCESSES**

14:30-15:30 Octavio García Depraect (Institute of Sustainable Processes, UVa). Biohydrogen production via dark fermentation

15:30-16:30 Jose Antonio Magdalena (Laboratoire de Biotechnologie de l'Environnement, INRAE). Biohydrogen production via microbial electrolysis cells

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## riday 16th June 2023

### **MODULE 5. ORGANIC WASTE BIOCONVERSION VIA ANAEROBIC NO PHOTOTROPHIC PROCESSES**

9:00-11:00 M<sup>a</sup> del Rosario Rodero (Institute of Sustainable Processes, UVa). Biogas and biomethane production.

11:00-11:30 Coffee break

11:30-13:00 M<sup>a</sup> del Rosario Rodero (Institute of Sustainable Processes, UVa). Biological biogas upgrading and alternative biogas applications

13:00-14:30 Lunch

14:30-16:30 Víctor Pérez (Institute of Sustainable Processes, UVa). Techno-economic analysis of bioprocesses. Case study: biogas bioconversion into ectoine in waste treatment plants

16:30-17:00 M<sup>a</sup> del Rosario Rodero (Institute of Sustainable Processes, UVa). Questionnaire and information about the virtual component.

17:00 Raúl Muñoz (Institute of Sustainable Processes, UVa). Closure of the presential course.

## Virtual component

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onday 19th June 2023.

### MODULE 4. MICROALGAE FOR CARBON AND NUTRIENTS RECOVERY

9:00-10:00 Giuseppina Oliva (University of Salerno). Valorization of microalgae biomass: biorefinery perspectives

10:00-11:00 Elena Ficara (Politecnico di Milano). Modelling of microalgae/bacteria-based bioremediation in open ponds

11:00-11:15 Break

### MODULE 5. ORGANIC WASTE BIOCONVERSION VIA ANAEROBIC AND PHOTOTROPHIC PROCESSES

11:15-12:15 Ramón Ganigué (University of Gent). Production of organics acids from organic waste and mixotrophic C1 conversions.

### MODULE 6. CO<sub>2</sub> FIXATION AND UTILIZATION VIA ANAEROBIC AND ANOXYGENIC PROCESSES

12:15-13:15 Roxana Ángeles (Institute of Sustainable Processes, UVa). CO<sub>2</sub> conversion into value added products by anoxygenic photosynthetic bacteria

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ednesday 21st June 2023

### MODULE 6. CO<sub>2</sub> FIXATION AND UTILIZATION VIA ANAEROBIC AND ANOXYGENIC PROCESSES

9:00-10:00 María Fernanda Pérez Bernal (Laboratoire de Biotechnologie de l'Environnement, INRAE). CO<sub>2</sub> fixation through microbial electrosynthesis

10:00-11:00 Ioannis Vyrides (Cyprus University). Use of zero valent metal - soluble CO<sub>2</sub> and anaerobic microbes to produce methane or acetic acid or higher molecules.

11:00-11:15 Break

### MODULE 7. MICROBIAL PROTEIN PRODUCTION COUPLED TO CARBON CAPTURE

11:15-12:15 Myrsini Sakarika (University of Gent). Coupling microbial protein production to carbon capture and utilization.

12:15-13:15 Jo de Vrieze (University of Gent). Production of microbial protein from biogas.

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hursday 22nd June 2023.

9:00-11:00 Student presentations

11:00 Closure of the course



# Biological Carbon Capture Technologies

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